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FIG. 1

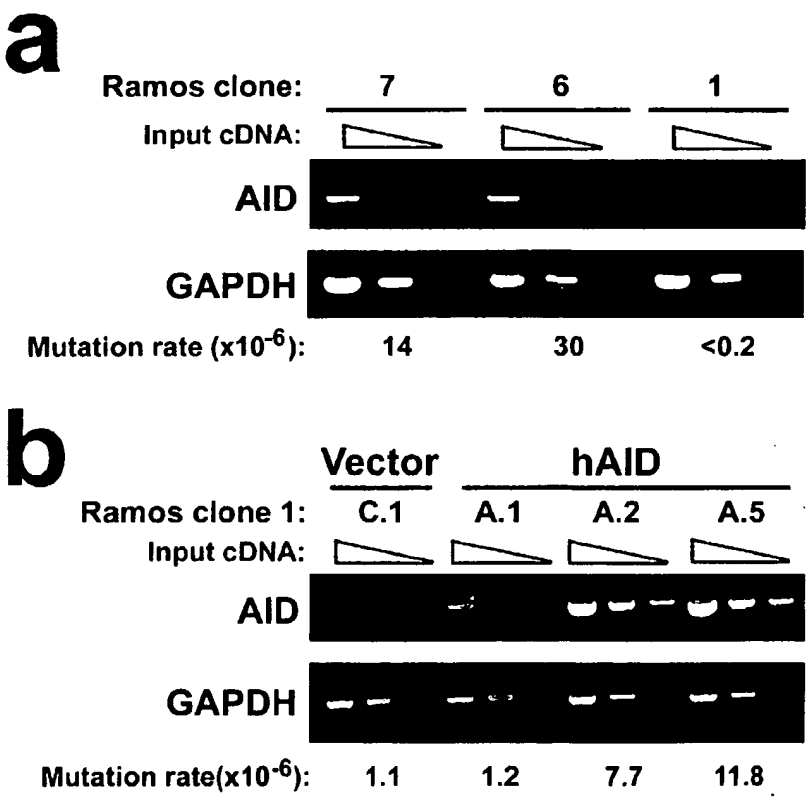

FIG. 2

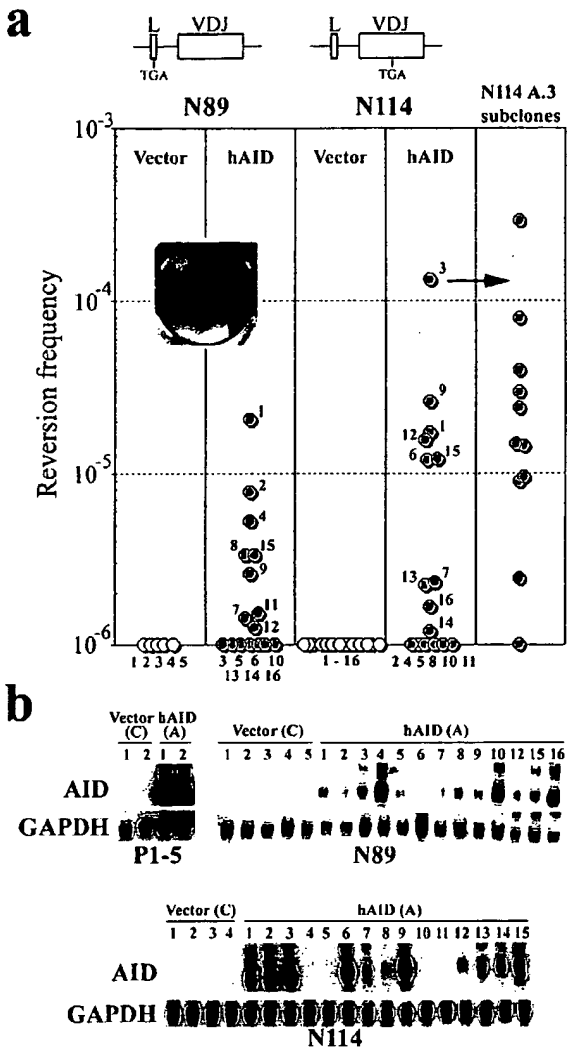

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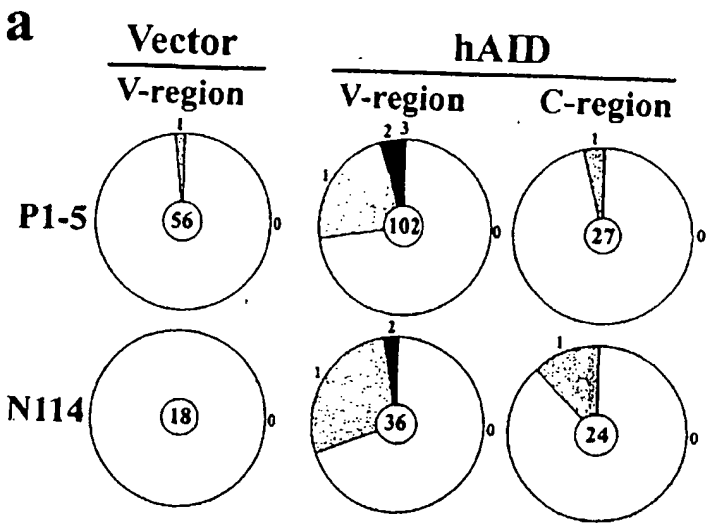
FIG. 3


a
Vector
V-region
hAID
V-region
C-region
P1-5
N114
56
102
27
18
36
24
b
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TGTCCTGCAAGGCTTCTGGCTACACCTTCACCAGCTACTGGATGCACTGGGTGAA 110
GCAGAGGCCTGGACGAGGCCTTGAGTGGATTGGAAGGATTGATCCTAATAGTGGT 165
GGTACTAAGTACAATGAGAAGTTCAAGAGCAAGGCCACACTGACTGTAGACAAAC 220
CCTCCAGCACAGCCTACATGCAGCTCAGCAGCCTGACATCTGAGGACTCTGCGGT 275
CTATTATTGTGCAAGAGGGTACTATGGTATCCACTTTGACTACTGGGGCCAAGGC 330
ACCACTCTCACA

FIG. 4

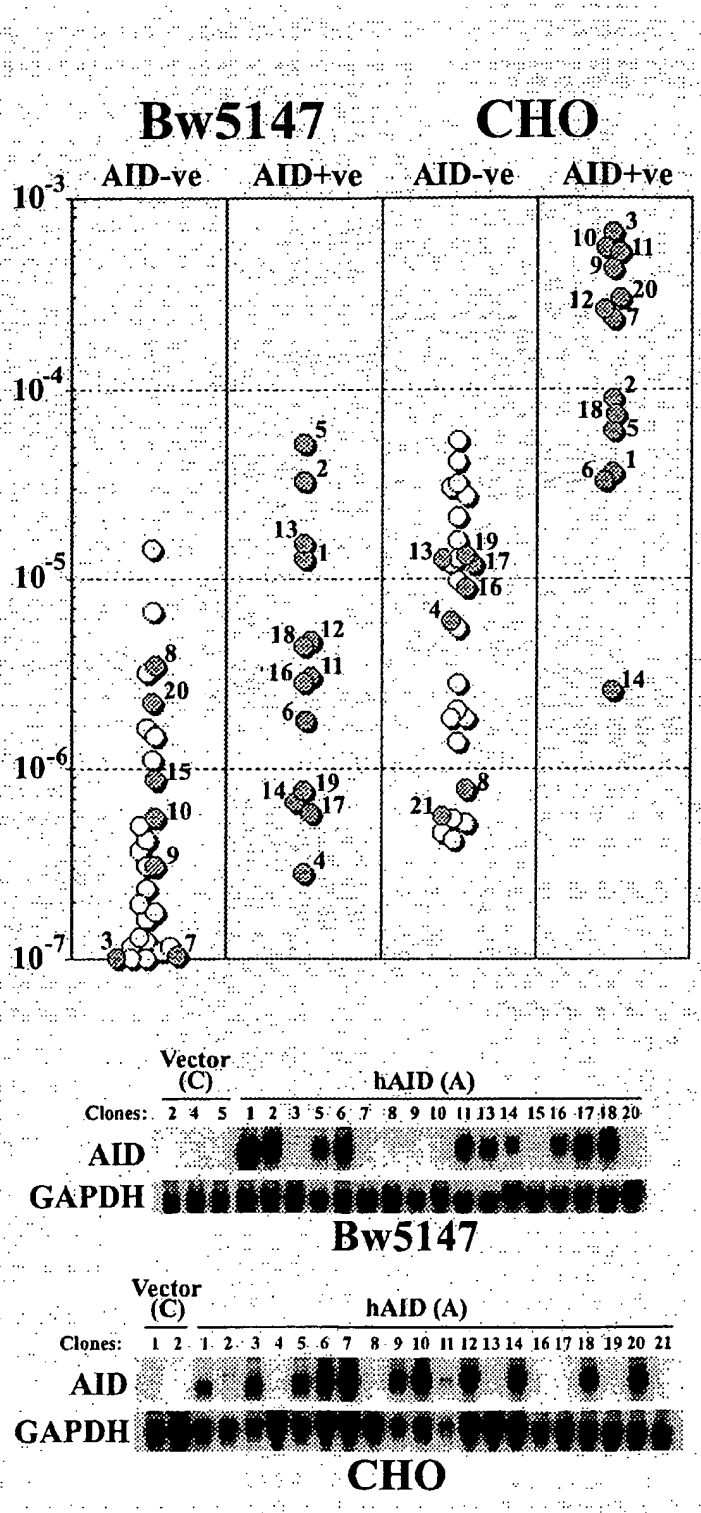

FIG. 5

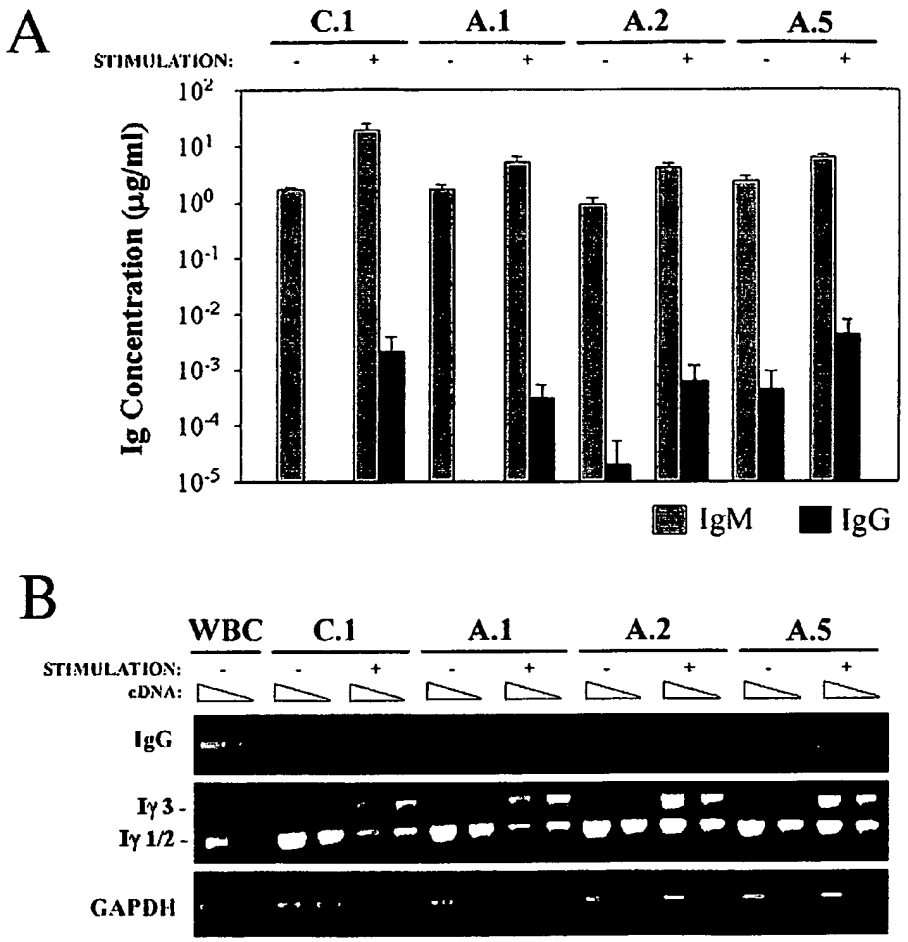

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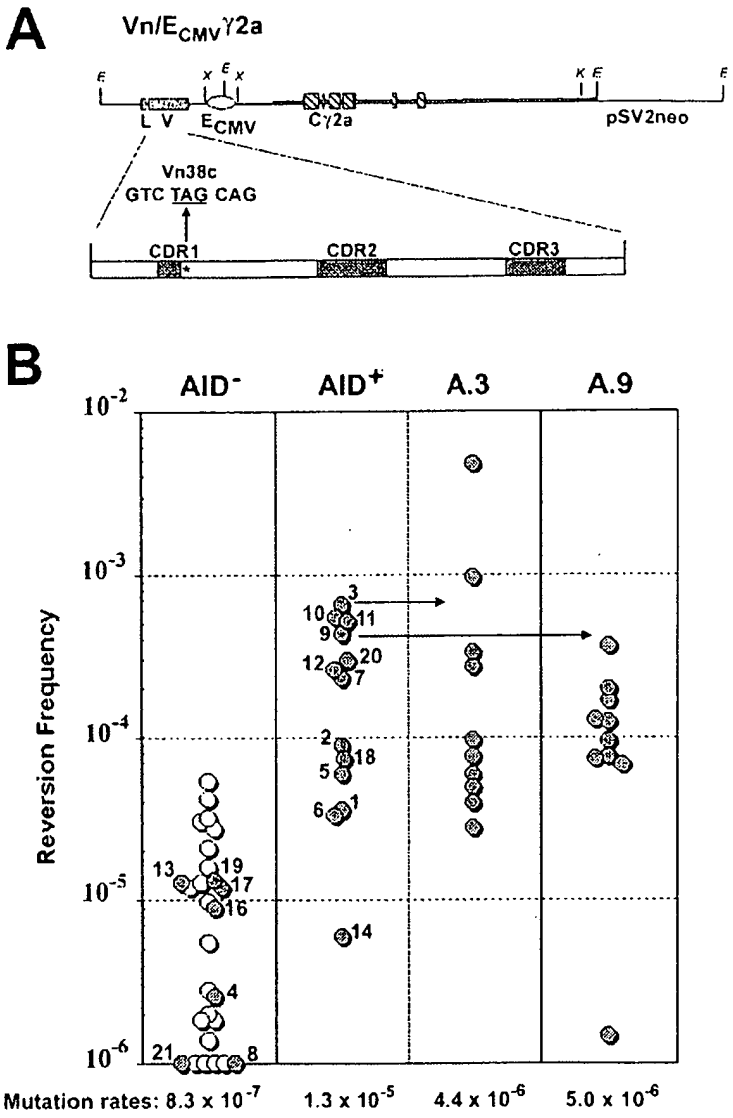
FIG. 6

Ramos = A
P1-5 = a
CHO = A

```
        a  A C
ATGGACAGCCTCTTGATGAACCGGAGGAAGTTTCTTTACCAATTCAAAAA

                                        g
           t    a       T     G      g
TGTCCGCTGGGCTAAGGGTCGGCGTGAGACCTACCTGTGCTACGTAGTGA 100

           C     g
AGAGGCGTGACAGTGCTACATCCTTTTCACTGGACTTTGGTTATCTTCGC

                T
     t    a    G              T
AATAAGAACGGCTGCCACGTGGAATTGCTCTTCCTCCGCTACATCTCGGA 200

     G  C         T                                 C
CTGGGACCTAGACCCTGGCCGCTGCTACCGCGTCACCTGGTTCACCTCCT

           G                                  A
GGAGCCCCTGCTACGACTGTGCCCGACATGTGGCCGACTTTCTGCGAGGG 300

                                                  G
  T                                T                T
AACCCCAACCTCAGTCTGAGGATCTTCACCGCGCGCCTCTACTTCTGTGA

     A           t
     AG          a        A
GGACCGCAAGGCTGAGCCCGAGGGGCTGCGGCGGCTGCACCGCGCCGGGG 400

 a       t        t tA         G          A         t
TGCAAATAGCCATCATGACCTTCAAAGATTATTTTTACTGCTGGAATACT

                                                 A
TTTGTAGAAAACCATGAAAGAACTTTCAAAGCCTGGGAAGGGCTGCATGA 500

                    t
                C   A      a    A          A
AAATTCAGTTCGTCTCTCCAGACAGCTTCGGCGCATCCTTTTGCCCCTGT

                  T T
ATGAGGTTGATGACTTACGAGACGCATTTCGTACTTTGGGACTTTGA     597
```

FIG. 7


A
Vn/E$_{CMV}$γ2a
L V
E$_{CMV}$
Cγ2a
pSV2neo
Vn38c
GTC TAG CAG
CDR1
CDR2
CDR3
B
AID$^-$
AID$^+$
A.3
A.9
Reversion Frequency
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
Mutation rates: 8.3 x 10^{-7}
1.3 x 10^{-5}
4.4 x 10^{-6}
5.0 x 10^{-6}